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ABSTRACT

This paper discusses the adequacy of using a collaborative model as research approach for studying the dynamics of a multicultural mathematics classroom. The goal of the research is the analysis of the immigrant students' processes of adapting to a new cultural context, from their home and school culture to the school culture that hosts them, understanding the construct culture in its broadest sense. This study has shown the importance of involving in-practice teachers in researching crucial issues related to their day-to-day teaching. (Author/KHR)

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Researching multicultural classes: a collaborative approach

Núria Gorgorio, Núria Planas
Universitat Autonoma de Barcelona

In this paper we discuss the adequacy of using a collaborative model as a research approach for studying the dynamics of a multicultural mathematics classroom[1]. The goal of the research is the analysis of the immigrant students' processes of adapting to a new cultural context, from their home and school culture to the school culture that hosts them, understanding the construct 'culture' in its broadest sense. Our study has shown the importance of involving in-practice teachers in researching crucial issues related to their day-to-day teaching.

The research within its context

The research we present is framed within a wider one that clearly has an intention of change in the politics of the educational system in Catalonia, an autonomous region in northern Spain (capital Barcelona). Since 1997, the authors are working in a project[1] commissioned by the Ministry of Education in Catalonia, concerned with finding more appropriate ways to teach mathematics in schools with large numbers of immigrant students.

In recent years, there has been increasing immigration into Catalonia that has led to significant changes in the school population. The immigrant population in Catalonia is about 1,6% of the whole population and, according to the register of inhabitants in 1998 in Barcelona, the area of the project, it reached 2,3%. Even if this number may seem not to be significant quantitatively, it is certainly significant qualitatively, because the reality of a multicultural classroom raises many questions related to issues concerning equity and justice (Keitel et al., 1989). At present, most of the immigrant pupils come from North Africa (Magreb), but others come from countries in other parts of Africa, North and South America, Asia and Eastern Europe.

Even if the project was initially the result of a request from the administration, the team's understanding of the multicultural situation in the school goes far beyond that of the educational administration. It has been a long process of discussion with the administration to negotiate the goals of the research. The team has negotiated strongly, and continues to do so, to change what initially was a policy-driven 'research' project into a research project with no inverted commas. However, it is hard to change the views of the people in the educational administration about mathematics being a cultural product rather than a universal matter, to have them abandon the simple idea of the mathematical utilitarian culture, and especially to have them compromise about the social and political implications of our research.

Probably the most difficult arguments with bureaucrats and politicians have been about mathematics being a cultural product, about learning and teaching mathematics being linked to values, beliefs and expectations, and about the fact that these emotional aspects can explain many of difficulties immigrant students experience when learning mathematics. We have also spent part of our time trying to change the educational bureaucrats' idea of a 'cognitive or cultural deficit' to be 'compensated', by emphasising with them the importance and possibility of building on the potentialities every student has.

The authors consider that explaining the difficulties immigrant children have in school in terms of cognitive deficit is too simplistic and questionable (Ginsburg & Allardine, 1984; Nunes, Schliemman and Carraher, 1993; Rasekoala, 1997). Moreover, this interpretation has social implications, because it projects particular expectations onto concrete cultural groups, which confirms our opposition to it because of our belief in the importance of students' personal values and experiences. To explain the difficulties that many immigrant students face in their mathematics learning it is not enough to consider them in terms of the students' cognitive abilities, in terms of the quality of the teaching they receive, or in terms of the adequacy of the communication tools. Mathematics education, to be understood, should be embedded in the comprehension of the social and cultural reality where it takes place (Oliveras, 1996).

The mathematics classroom is a situation where many social and cultural conflicts arise that should be incorporated into the research models in mathematics education. In particular, we understand that the difficulties immigrant students experience when learning mathematics are often linked to the 'distance' between their own social and cultural frames of reference and the implicit ones within school. Our starting point is the consideration of the cultural contribution of ethnic minorities and of different social groups as a source of richness to be maintained and shared. The team does not see cultural differences, and the cultural conflicts arising from them, as a 'problem to be solved' nor as a 'diversity to be treated', but as a potentiality.

Regarding the analysis of the social dynamics of the mathematics classroom and the cultural conflicts arising there, and as a result of the different meanings attached by the participants to its different aspects, our research has three goals:

- to document, analyse and reflect on how mathematics teachers, as agents of change, understand the cultural and social conflicts and disruptions arising in their mathematics classrooms,
- to identify and interpret different external manifestations of cultural conflicts related to the different meanings attached to the norms that regulate the social dynamics of the mathematics classroom and the norms that regulate classroom mathematical practice,
- to identify, experiment with, and analyse different teaching strategies and

social dynamics that could contribute to making visible the cultural conflict and to co-construct meanings in order to facilitate the learning process of immigrant students.

The research model from a theoretical perspective

The lack of relationship between research and practice has been fully documented, both in education in general and in mathematics education in particular. It is clear however from various research summaries (Bishop et al, 1996: Grouws, 1992) that preserving the dichotomy between research and practice is no longer acceptable, and that there are increasing moves to involve teachers much more in research. However, often in research that has the classroom as the object of its study, even if the teachers are participants, their roles consist only in developing the researchers' proposals, most of the time without even knowing the grounds for their actions (Cook & Reichardt, 1986).

Therefore, the need exists for knowing more about teachers' perspectives on practical issues which researchers could seriously address, and for counting on their expertise and knowledge to find ways to research them and to interpret the results. As Bishop (1996) states: 'As mathematics education is a practitioner-dependent activity, the research process should therefore be practitioner-focussed. This means that it should address practitioners' issues and problems, and that practitioners should be involved at all stages of a research project, particularly at the start. It does not mean that there is no place for reflection or for theory, but only that the practitioner-orientation should predominate.' (Bishop, op. cit., p. 4)

The main goal of our project being to 'promote changes' in the educational context, we therefore considered, as do Kemmis & Taggart (1988), that the best approach would be action-research: that is, research done by people on their own work, following an essentially critical approach to schooling, and with the explicit aim of improvement. As Schon (1983) points out, action-research should enable us to build bridges from what is going on in educational research to the intuitive educational acts. Action-research was originally introduced into the field of education with the intention of creating real improvement in educational practice, because it was considered that the educational research developed until then did not bring with it any real improvement in practice. More than any other approach, action-research takes 'change' as its focus, and encourages practitioners at different levels to research collaboratively their shared problems, and as these authors point out, 'the approach is only action research when it is collaborative' (Kemmis &Taggart, op.cit., p. 5).

Insisting on the ideas of teachers reflecting on their actions, rather than just being technicians, and on researchers becoming more aware of classroom limitations and constraints, should be beneficial for both practice and research.

We consider, as do Cohen and Manion (1990), that action-research is an alternative both to external research which has little connection with classroom realities, and also to subjective practice, which omits the guarantees of external observers that ensure triangulation of the data and their interpretation. However, the development, if not the survival, of action-research will not be possible without the contribution of the different educational administrations. They need to facilitate it by such means as: giving economic support, reducing the teachers' school schedules, facilitating their attendance at conferences, promoting in-service working groups, reforming rigid working structures, and restructuring the power hierarchies (Baumann, 1996).

There is no doubt that balancing research and practice is not an easy task. Wong (1995) remarks that there are two kinds of conflict between the role of teacher and the role of researcher, those of purpose and of conduct. Wong refers to the tension emerging between the purposes of the two perspectives: as a researcher observation has to take place without intervention, without guidance, while teaching requires the leading of the learning process, even if this act alters the observable situation. However, the use of an interpretative paradigm, and the use of qualitative methods reduces the conflicts stated by Wong (1995). Wilson (1995) criticises Wong's perspective on conflicts, arguing that it is due to the use of a quantitative paradigm, where the researcher is a subject alien to the studied phenomena. In contrast, according to this author, viewed from an interpretative approach, conflicts can become a kind of compatibility.

The contributions of different research projects dealing with the socio-cultural analysis of learning situations, some of them integrating the complex interaction among affective, cognitive and cultural aspects, together with our personal experiences in previous studies convinced the team that the most adequate research approach, given our goals, was a collaborative one under a qualitative and interpretative paradigm.

Reflections from the perpsective of our project

Doing research within a collaborative model with in-service teachers, and having teachers participate in action-research projects implies a move that, at least in our context, still needs to be justified within both the university community and the school systems. Our university system, both academically and administratively, is still reluctant to accept in-service teachers as full members of research teams. Academics at the university do not consider that practitioners have enough knowledge and expertise in the field of research. Neither does its administrative system yet consider practitioners as members of research groups for the provision of grants. Within the school system, teachers at mathematics departments, principals and inspectors and, more globally, the educational administration, find it difficult to accept and justify practitioners devoting part of their time to research. In particular, as Elliott (1989) states, from different

instances related to educational research, action-research is reluctantly accepted or considered because of the complexities of the many variables that this kind of research involves. This argument conveniently forgets that this approach facilitates, more than any others, changes in the practice and the interiorising of the results of the researchers by those that are assumed to implement them.

The reasons for deciding to develop our research collaboratively are several. At present, the research agendas are still dominated by the researchers' questions and aims and not by those of the practitioners. However, we are addressing a crucial issue related strongly to social demands within a particular context. Change being the final goal of our research project, we are convinced that the teachers' contributions on stating the points that should be addressed and on how to address them are crucial.

The issues addressed in our research are actual teachers' problems and have to do with actual teaching constraints and limitations when teaching mathematics in multicultural settings. For instance, in our particular context, teachers feel that one of the biggest problems that they have to face in their classes is communication, because most of their immigrant students have difficulty with the language of the teaching. On one side, the lack of a common language makes it difficult for the teachers to come to know about their students' thinking processes, and for the students to achieve the construction of mathematical meanings[2]. In particular, very often students react to this lack of communication through the 'suspension of sense making' (Schoenfeld, 1994). On the other hand, language being a social tool for communication, the lack of a common framework of reference is at the origin of different interpretations of the social norm, of the norm of the mathematical practice and of the socio-mathematical norm and, therefore, at the origin of many cultural conflicts[3]. Therefore, one of our research goals, related to one of the 'limitations felt by the teachers', namely the difficulty of communication, is to find teaching strategies and methods to minimize the lack of communication and the cultural conflicts.

Concerning the search for teaching strategies that could make visible cultural conflicts and minimize them, it is teachers who can conform more to practitioners' criteria and methods. Teacher's experience and knowledge about the real possibilities for change and their implementation has been crucial in the search for teaching styles and classroom organizations that could modify the social dynamics of the mathematics classroom. And it is also teachers, with their day-to-day life with their students, who have brought to the group the necessary knowledge of the students' real interests and motivations that allow us to create classroom activities that create meaning for the students.

Moreover, teachers have a better knowledge of the particular research context than researchers from university have. This is especially true in our project because, at least in our context, university researchers still have very little

knowledge of multicultural classrooms. For instance, concerning methodological approaches, the teachers' knowledge of their students was the only way of establishing links between what was desirable from a theoretical point of view and what was really possible within the classroom. Some methods, like videotaping a classroom or interviewing students, that are crucial for a socio-cultural approach and that could be considered 'easy' by a university researcher, were reluctantly accepted by the students, because of their personal values. It was only through the negotiation of the teachers within the groups, and on the basis of the emotional relationship that the students established with them, that the students agreed to cooperate.

On the other hand, teachers' questions and explanations derive from a knowledge domain that is distinct from, and complementary, to that of isolated researchers from university. Working collaboratively facilitates communication between the different domains, overcoming the mutual exclusion of practice and research. The research focus being on teachers and teaching, we needed to contact and work with practitioners. The presence of teachers as full members of the research group, legitimates and facilitates the contact and the communicating process with other teachers, and also helps with finding ways to disseminate the research findings and the innovation proposals. Moreover, their participation in the research process, benefits themselves as teachers and their own teaching practices. It can also benefit other teachers in other ways, particularly by sharing research approaches with them that any teachers can use. Besides that, the presence of teachers on the research group strongly enriches the process of interpreting the situation and the triangulation of the data, illustrating the complementary points of view of university researchers and practitioners.

The collaborative work allows us to take into consideration not only the factors that condition practice, but also the connections with published theory. Both of these play an important role in shaping the research, by establishing the possibilities, limitations and constraints of the context, and also by offering the dimensions of generality that gives sense to the research. Working collaboratively facilitates the researchers' contribution to the development of practice by not only contextualising the research within the classroom realities, but also by establishing the whole study in terms of practitioners' needs and schemes of knowledge. The study thereby becomes both an analysis of practice and a search for explanations towards a development of theory.

At this moment, when mathematics teaching is facing many tensions with the implementation of the new educational system in Spain, we consider that collaborative research and action-research can help the educational community to commit itself to the changes in the educational practices. By 'educational community' we mean agents, for example researchers and teachers, and also structures, the educational administration. On the other hand, given that the aims of the research were under negotiation, essentially with bureaucrats and

politicians who in general believe that university research is far away from the school real needs, the idea of collaborative research contributed greatly to that process of negotiation.

After two years working, we are convinced from the perspective of our project, that the understanding of the situation and the outcomes we could get through a collaborative and action-research approach, under a qualitative and interpretative paradigm[1], were worth all the constraints and conflicts we were facing in getting involved in action-research.

The teachers as researchers in our project

Having received the request to address an issue that is mainly connected with schools, the first author, being the commissioned researcher and a university lecturer, argued for the necessity of working in a team which included different members of the educational community. The negotiation with the educational administration resulted in a collaborative team, whose other members are in-service secondary and primary mathematics teachers, with a deep experience in multicultural settings, and already linked with research at university, and who also have a partial release of their teaching hours to devote time to the project.

In the previous sections we have argued, both from a theoretical perspective and from the perspective of our project the importance of having teachers as full members of the research team. In the following section, we will present, through some particular examples, how we establish our collaboration, taking always into account the expertise of the teachers, the published theoretical frameworks, the issues to be investigated, the actions to be developed and the results of our project.

The first questions we usually begin with concern particular cases that arise in day-to-day practice. From the joint discussion of the case we situate it within a theoretical framework to explain it. For instance, during a mathematics lesson, Kamrum, a Pakistani boy, left the classroom because he refused to work in the small group where he was assigned. We understand this case as being one where the teacher and the student attach a different meaning to the classroom organization and to the teacher's role. The student was interviewed by his teacher in the next session. Kamrum, on the one hand, did not accept to work with the girls on the group and, on the other hand, he considered that it was his teacher's duty, according to his previous cultural framework, to solve the problem on the blackboard. Through his explanations, what initially could have been thought of as a disruption, was just an adjustment between the meanings he and his teacher were attaching to the same situation.

Through the discussion of this case in the light of the existing theory, we identified other similar cases, which concerned not only Kamrum, but also Saima, Sajid, Aftab.... and many others. It was not anymore about living in the classroom, but about the need to pay explicit attention to the norms that regulate the social

dynamics of the mathematics classroom. Similar processes led us to the need to take into account also the norms of the mathematical practice and the socio-mathematical norms.

From the discussion of the particular cases we decide that some actions should be taken in order to create classroom situations that allowed us to elicit the conflicts arising from different understandings of the norms and to 'positivise' them. Some proposals are made concerning implementing particular classroom organizations, learning activities and teacher interventions that could be helpful to our purpose. The different proposals are developed in their classrooms, the teacher keeps a diary, the lessons are videotaped, and one of the other members of the group acts as an external observer.

In our weekly meetings, we jointly discuss the data coming from the lessons. We analyse them, from the perspective of our goals on the basis of the transcription of the videos, the teacher's diary and the notes of the external observer. All the process is constantly under feedback, in every meeting new ideas and new points of view are discussed that modify the proposals for new actions to be taken next. The group also keeps a diary of the meetings, which is very useful for analyzing our own process and how our initial assumptions have evolved. We want also to note that the fact of publishing and presenting our research, both in academic contexts and in in-service teacher programs, has also forced us to go deeper in the reflections.

However, collaborative research and action-research also have their limitations, both practical and methodological. On the one hand, the teachers involved must continue to do their jobs within the schools, and this means within the constraints of the administration, including in particular the time they are allowed to devote to the project. On the other hand, even if following this approach makes it easier for teachers to participate in research studies than other approaches, some difficulties and tensions inevitably arise from the fact of teachers researching their own teaching. One of the needs we were aware of was to how to ensure a distance between the two simultaneous roles of being a teacher and a researcher.

In particular, we had to face the tensions between the teachers' responsibility to the students and to the research. In particular, there were tensions regarding issues of students feeling reluctant to participate in the research, by for instance not wanting to attend a class if it was going to be videotaped. Our response to this kind of tension was this: the research team explicitly agreed that we had a responsibility as teachers that was over and above that which we had as researchers, even if that could mean a 'loss' for the study. We understand this kind of limitation as part of our work with people having their own system of beliefs and values.

We had also to face the risk of bias when interpreting the data obtained from a classroom where the role of teacher and researcher were played by the same person. Analyzing the data obtained in a study developed in one's own class requires important control actions (Robinson, 1998). Discussing and contrasting the different points of view within the research team, having an observer in the classroom who is different from the teacher, documenting and analyzing the developing of the lessons through the video recording and the teacher's diary have all helped to control the biases.

After three years of working on the project, we are aware that there are still plenty of unresolved issues, which are of concern not just to us, but we suspect to anyone involved in such kind of research. For example, up to what point can/ does the research on mathematics education reflect the real needs of the society where it takes place? How are these needs established? Who in charge is to decide which changes should be implemented in the mathematics curriculum in order to guarantee mathematics learning for ALL? Why, so often, does the educational administration pay so little attention to what is being done in the research field? Is it the fault of the researchers themselves because of failing to communicate their results in such a way that they can be useful for the classroom? Or is it because the research questions addressed are far away from the reality of the classroom?

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[1] The political and social contexts of the research, as well as its global aims, were already presented in a contribution to MEAS1, 1st International Conference on Mathematics Education and Society, held at Nottingham on September 1998, under the title *'Starting a research project with immigrant students: constraints, possibilities, observations and challenges'* by N. Gorgorió.

[2] The project is funded by a Catalan private foundation devoted to education, Fundació Propedagògic.

[3] See Gorgorió & Planas (forthcoming): 'Teaching mathematics to immigrant students: A multilingual situation'. *Educational Studies in Mathematics*.

[4] See Gorgorió, N., Planas, N., & Vilella, X. (forthcoming): 'Immigrant children learning mathematics in mainstream schools'. In G. Abreu, A. Bishop & N. Presmeg (eds). *Transitions between Contexts for Mathematics Learning*, Dordrecht, Netherlands: Kluwer Ac. Pub.

[5] See Gorgorió, N., *'Starting a research project with immigrant students: constraints, possibilities, observations and challenges'*, on the proceedings of the MEAS1, 1st International Conference on Mathematics Education and Society, to know more about the research procedures used.

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